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Research Article

Pharmacognostic, Physicochemical, Phytochemical evaluation and Thin layer chromatography of *Ocimum basilicum* leaves

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Abstract

O. basilicum is a annual herb commonly referred to sweet basil and used in various traditional systems, is a member of the Lamiaceae family. The objective of this study is to gain comprehensive pharmacognostic, physicochemical characteristics, and phytochemical analysis of the leaves. The pharmacognostic criteria were assessed, including macroscopic and microscopic evaluations, transverse sections of the leaf, powder microscopy, fluorescence analysis, and physicochemical properties (Total Ash 14.60%, acid-insoluble ash 4.15%), water-soluble ash 3.27%; alcohol-soluble extractive value 2.4%; water-soluble extractive value 1.6%; moisture content 13%. Phytochemical screening of ethanolic leaf extracts indicates the presence of flavonoids, saponins, phenolic, tannins, and cardiac glycosides. The Rf values determined were 0.60, 0.68, and 0.72. The standardized parameters for pharmacognostics, physicochemical parameters, phytochemical properties, total phenolic content, total flavonoids content, and chromatographic analyses of *O. basilicum* leaves are revealed in this work.

Keywords: Fluorescence analysis, Physicochemical, Thin layer chromatography, TPC, TFC

INTRODUCTION

Ocimum genus has around 50-150 types of plants[1] and belonging to the Lamiaceae family. Tropical regions are really places to find Ocimum species. These places include Asia, Africa and India.[2] The Ocimum species are found in these areas. Sweet basil, or Ocimum basilicum, is a plant of the genus Ocimum that is found in South America, Africa, and Asia.[3] *O. basilicum* has large green leaves, glabrous, woody stems, and a broad, elliptical shape that measures 2.5 to 5 cm × 1 to 2.5 cm. It grows to a height of 20 to 80 cm. The 3 mm red, pink, or white flowers are grouped in terminal spikes.[4] In the past, *O. basilicum* fruit was used as traditional medicine to treat eye conditions, diarrhea, worm infestation, and inflammation.[5] In addition to being used as a tonic and vermifuge, leaves and blossoms can be used as a tea to cure diarrhea, gas, and nausea. *O. basilicum* has essential oils that are frequently used to cure wasp stings, snakebites, colds, and convulsions.[6] *O. basilicum* was utilized in Mediterranean cuisine, including Greek and Italian, throughout South Europe.[7]

MATERIALS AND METHODS

Plant collection: Fresh Plant leaves of *O. basilicum* were collected from local area of Prayagraj, U.P., India. The plant material identified and authenticated by Botanical Survey of India (BSI), Prayagraj, Authentication No.11/81/2025-26/ 54/Tech/912 on dated 30/03/2026.

Macroscopic studies: Organoleptic characteristics, such as color, taste, texture, shape, and size, were used in morphological investigations and assessed botanically.[8, 9, 10]

Microscopic studies: [8, 9, 10]

Leaf was cut into tiny transverse slices for microscopic examination. For additional observations and the identification of particular microscopic diagnostic features, the slices were placed in a glycerine water solution. Additionally, the powder properties and fluorescence examination were performed.

Physicochemical parameters [11, 12]

After powdering the dried plant leaves of *O. basilicum*, several physicochemical analyses were performed and values were noted, including those for foreign matter, moisture content, extractive value, and ash value.

Phytochemical screening [13, 14, 15]

100g of *O. basilicum* powder in a Soxhlet extractor was extracted using 95% ethanol. Following the concentration of the liquid extract, a number of qualitative chemical assays were performed and documented.

Total Flavonoids Content[16]

First, fill a graduated test tube with 50 ml of the extract, add 1 ml of methanol (Sigma Aldrich, CAS no. 67-56-1), and thoroughly mix. Next, add 4 ml of distilled water and 5% sodium nitrite (CDH, CAS no. 7632-00-0), and incubate for 5 minutes. Let it stand for ten minutes after adding the 10% w/v aluminum chloride solution (CDH, CAS no. 7446-70-0). Next, add 2 ml of 1M sodium hydroxide (Ranchem, CAS no. 1310-73-2) and use distilled water to get the content to 10 ml. A UV visible spectrophotometer is used to measure absorbance at 765 nm. The standard quercetin (Research Lab fine Chem, CAS no. 849061-97-8) absorbance is determined using the same approach. The calibration curve was used to calculate the total flavonoids content.

Total Phenolic Content[16]

Total phenolic content has been determined by FC method. One milligram per milliliter of the extract was put in a test tube; three milliliters of water was put in; then 0.5 milliliters of Folin-Ciocalteu reagent (CDH, batch no. 611221) was mixed. Then, added 20% sodium carbonate (Thomas Baker, CAS no. 497-19-8) and left it in the dark for about 10 minutes. Finally, measured the absorbance at 650 nm with a UV-visible spectrophotometer Likewise, measured the absorbance of gallic acid (CDH, CAS no. 5995-86-8).

Thin layer chromatography [17, 18]

Using an activated silica gel G plate as the stationary phase and chloroform: Methanol: Acetic acid (6:3:1) used as mobile phase, and an iodine solution or chamber as the detecting reagent, an alcoholic extract of *O. basilicum* was assessed for TLC.

RESULTS AND DISCUSSION

Macroscopic study: The organoleptic & macroscopic characters of the fruits as colour, odour, taste, shape, size, & surface were evaluated botanically.

Figure 1: *Ocimum basilicum* plant

Table 1: Macroscopic study of *Ocimum basilicum* leaf

Characters	Leaf
Colour	Upper surface darkish green upper surface and light green lower surface
Odour	Pleasant, aromatic, strong
Taste	Sweet
Size	2.5-5.3 cm long, 1.5- 2 cm width
Shape	Simple, ovate, oval
Margin	Entire, smooth
Apex	Acute
Venation	Pinnate, Reticulate
Surface	Pubescent
Base	Attenuate

Microscopic study:

Transverse section of *O. basilicum* leaf shows single layered cylindrical palisade cells; 4-6 layers of parenchymal cells, vascular bundles were ringed by parenchymatous cells. Glandular trichomes and diacytic stomata were also present

Figure 2: Transverse Section of *Ocimum basilicum*

Table 2: Powder characteristics of *Ocimum basilicum* leaf

S. no.	Features	Observation
		Leaf
1	**Nature**	Coarse powder
2	**Colour**	Greenish
3	**Odour**	Noxious
4	**Taste**	Slightly bitter

Powder microscopy: It is greenish coarse powder with bitter taste. The powder microscopic study reveals the presence of trichomes, parenchymal cells, lignin, calcium oxalate crystal & volatile oil sac.

Table 3: Fluorescence analysis of *Ocimum basilicum* leaf powder

Treatment	Visible	Long U.V. 254 nm	Short U.V. 365 nm
Powder	Brown	Black	Green
Powder + % KOH	Dark brown	Dark	Light green
Powder + 5%NaOH	Blackish green	Blackish	Green
Powder + $FeCl_3$	Black	dark	Blackish green
Powder + con. H_2SO_4	blackish	Dark	Blackish green
Powder + dil. H_2SO_4	Brown	Dark	Green
Powder + con. HCl	Brown	Black	Dark Green
Powder + dil. HCl	Brown	Dark	Greenish
Powder + con. HNO_3	Black	Dark	Light Green
Powder + dil. HNO_3	Brown	black	Light green
Powder + dil. NH_3	Black brown	Dark	Green
Powder + Iodine sol^n	Black -brown	Black	Blackish green

Table 4: Physicochemical data of *Ocimum basilicum* leaf

S.N.	Physicochemical Parameter	Values (% w/w)
1.	Foreign matter	Nil
2.	Moisture Content	13%
3.	Total Ash	14.60%
4.	Acid- Insoluble ash	4.15%
5.	Water soluble ash	3.27%
6.	Alcohol soluble extractive	2.4%
7.	Water soluble extractive	1.6%

Percentage yield and physical characteristics of various extract of *O. basilicum* leaf

Solvent extract	%w/w	Consistency	Fluorescence analysis		
			Visible	Long U.V.	Short U.V
Ethanol (95%)	28.38	Sticky	Blackish brown	Dark black	Greenish

Qualitative phytochemicals screening

Phytochemical screening of ethanolic extract of *O. basilicum* shows the presence of several secondary metabolites. Shinoda and zinc-hydrochloric acid tests shows the presence for flavonoids while triterpenoids & alkaloids were absent. Saponins, tannins, and steroids were also present.

Table 5: Qualitative Phytochemical screening of Ethanolic extract of *O. basilicum*

	Phytochemical test	Ethanolic extract of *O. basilicum*
1.	Carbohydrates i) Molisch ii) Fehling Reagent	 -ve -ve
2.	Alkaloids i) Dragondroff's reagent ii) Mayer's reagent iii) Wagner reagent iv) Hager reagent	 - - - -
3.	Tannins i) Lead acetate ii) FeCl3	 + +
4.	Flavonoids i) Shinoda test ii) Zinc- HCl reduction test iii) Alkaline reagent test	 ++ ++ ++
5.	Saponins i) Foam test	 +
6.	Steroids i) Libermann – Burchard test	 ++
7.	Cardiac glycosides Keller-Kiliani	 +
8.	Triterpens Salkowaski's test	 -

+++ More amount, ++ moderate amount, + less amount, - absent

Table 6: Total Phenolic Content and Total Flavonoid content

Extract	Total Phenolic content mg GAE/g	Total Flavonoid content mg Quercetin equivalent/g
Ethanolic extract *O. basilicum* leaves	25.40	18.30

Table 7: TLC Profile: Thin layer chromatography of alcoholic extract of *O. basilicum*

Solvent system	No. of spots	Rf value	
Chloroform: Methanol: Acetic acid (6:3:1) Spraying agent/Detection : Iodine chamber	3	0.60, 0.68, 0.72	

DISCUSSION:

T.S. of *O. basilicum* shows isodiametric epicarp with thin cuticle, mesocarp have 5-7 layers of large parencymatous elongated cells with starch grains, vascular bundles are present in the mesocarp. Powder microscopy reveals the presence of parenchymal cells, trichomes, & calcium oxalate crystals. Qualitative phytochemical screening indicates presence of alkaloids, tannins, tritepenes, steroids and flavonoids, carbohydrates; total phenolic content and total flavonoids contents were found 25.40 mg GAE/g and 18.30mg Quercetin eq/g respectively; thin layer chromatography of ethanolic extracts indicates presence of many compounds.

CONCLUSION:

The plant *O. basilicum* is a common species that has been used traditionally. The above pharmacognostic, physicochemical, phytochemical & chromatographic studies will give approaches for identification, safety & quality parameters as well as new incentive to natural system of medicine in the research & in the treatment of other diseases.

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